INSTRUCTION SHEET

TYPE 874-FBL BIAS INSERTION UNIT

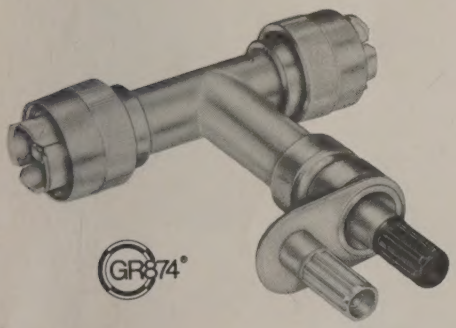


Figure 1. Type 874-FBL Bias Insertion Unit.

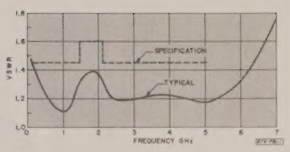
SPECIFICATIONS

Used with slotted lines, the GR 1602-B Admittance Meter, and 1609 UHF Admittance Bridge for immittance and similar measurements where bias is to be applied to diodes, transistors, and other solid-state devices. It comprises a blocking capacitor in series with the line, an isolating choke, and a low-pass filter.

In slotted-line measurements, it is inserted at the source end of the line and therefore introduces no reflections at the measurement terminals.

Dc Current: 2.5 A, max.
Dc Voltage: 400 V, max.
VSWR: See curves.
Insertion Loss: Typically, <1.7 dB from 300 MHz to 3 GHz, <0.8 dB from 3 GHz to 5 GHz.
Dimensions: 4⅜ x 3⅛ in. (115 x 99 mm).
Net Weight: 6½ oz (185 g).

U.S. Patent No. 2,548,457.

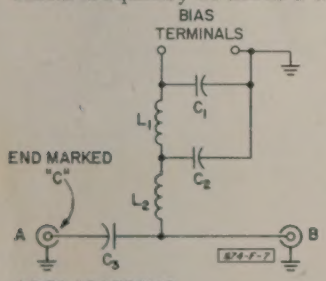


DESCRIPTION

The Type 874-FBL Bias Insertion Unit is a dc-bias and isolation unit used to bias devices installed in coaxial-line systems. It is particularly useful in measuring the immittance of semiconductor devices with a slotted line. It is fitted with locking GR874 connectors at both rf ports and 3/4-inch spaced binding posts of the GR938 type at the dc input. See Figure 1.

PRINCIPLES OF OPERATION

In the schematic diagram, Figure 2, the inductor L_2 and the capacitor C_3 are designed to introduce the minimum discontinuity in the 50-ohm system between the coaxial connectors at each end. Capacitor C_3 dc-isolates the biasing system from devices connected to coaxial terminals "A", usually signal generators or attenuators. The low-pass filter, $L_1/C_1/C_2$ prevents the radio-frequency signals present in the coaxial line from passing out the bias terminals. This filter has a cutoff frequency of about 1 MHz.



C_1 = 3900 pF
C_2 = 3900 pF
C_3 = 4700 pF
L_1 = 4.7 μH
L_2 = 0.3 μH

Figure 2. Schematic diagram for Type 874-FBL.

APPLICATIONS

The principal application of the Type 874-FBL Bias Insertion Unit is in the biasing of semiconductor devices, in particular, in impedance measurements in the frequency range 300 MHz to 5 GHz. Other applications include construction of diode- or transistor-amplifier circuits in the coaxial configuration and low- and high-frequency combining circuits.

SEMICONDUCTOR IMMITTANCE MEASUREMENTS WITH SLOTTED LINE OR DIRECTIONAL COUPLER

The Type 874-FBL is usually installed at the generator end of an immittance-measuring instrument, so that the small but observable discontinuities of the bias unit are not introduced in the "unknown" circuit. A typical configuration for two-terminal unknowns is shown in Figure 3. For transistor biasing, another Bias Insertion Unit is employed at the transistor as shown in Figure 4.

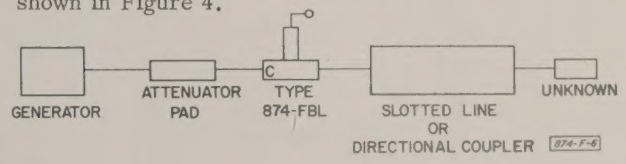


Figure 3. Use of the Type 874-FBL for immittance measurements on a two-terminal unknown.

The required termination is:

1. A Type 874-W50BL, if scattering coefficients (reflection and transmission coefficients), normalized to 50 ohms, are being measured.

2. A Type 874-D20L sliding short circuit, if y or z parameters are being measured. In this case, an ideal open or short circuit is required at the transistor terminals.

Because the finite loss in the Type 874-FBL is aggravated if a voltage maximum appears at the choke within the unit, it is sometimes necessary to use a line-stretcher (Type 874-LK10L) between the Bias Insertion Unit and the transistor jig. This ensures that the open circuit is of sufficiently high impedance and that the short circuit is of sufficiently low impedance. The Type 874-LK10L and the Type 874-D20L are adjusted together to obtain the final terminating impedance at the required reference plane, while at the same time obtaining the highest VSWR.

The transistor test jigs recommended are the Types 1607-P41, -42, -43, -44 Transistor Mounts. These mounts are accessories for the Type 1607 Transfer Function and Immittance Bridge that permit its use

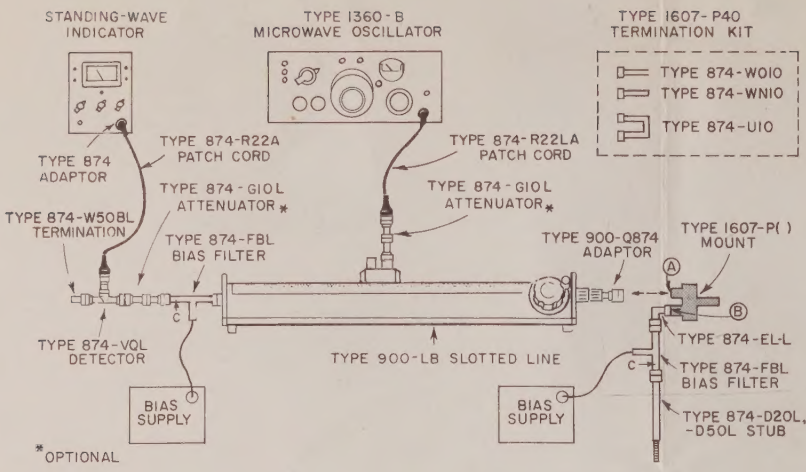


Figure 4. Type 874-FBL units used in measurements with a transistor mount.

in measurements of transistor parameters at frequencies up to 1.5 GHz. They accept over 30 commonly used transistor packages. These, and the Type 1607-P40 termination kit, permit transistor measurements up to about 5 GHz, when used with instruments such as the Type 900-LB Precision Slotted Line. Specific procedures are given in the instruction sheets furnished with the mounts.

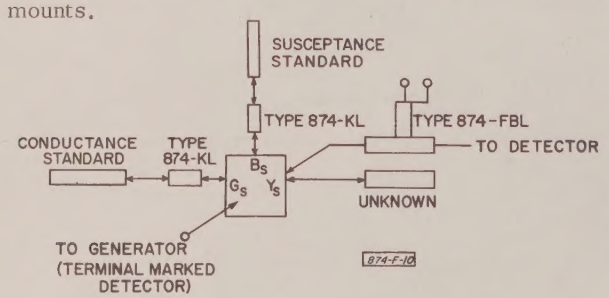


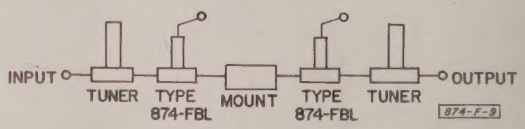
Figure 5. Use of the Type 874-FBL with the Type 1602-B UHF Admittance Meter.

WITH THE TYPE 1602 UHF ADMITTANCE METER

The Type 1602 is operated with the DET and GEN connections interchanged. The conductance and susceptance standards are dc blocked with General Radio Type 874-KL Coaxial Coupling Capacitor units. The Type 874-FBL is connected to the terminals labeled GEN at the rear of the instrument, as shown in Figure 5, but is actually in the detector circuit.

WITH AMPLIFIER OR OSCILLATOR CIRCUITS.

Experimental coaxial circuits involving semiconductor elements may be made up with other GR874 components, with the Type 874-FBL employed for applying bias to the elements.* The bias system in this case does not interact significantly with the rf circuits. A typical configuration is shown in Figure 6.



TUNERS: Type 874-D20L adjustable stub in a Type 874-TL Tee

MOUNT: Types 1607-P101, -P102, -P111, -P401, -P41, -P42, -P43, or -P44

Figure 6. Typical coaxial test set-up in GR874 components that utilizes the Type 874-FBL for rf transistor measurements.

COMBINER

When combining a high radio-frequency signal and, say, an audio signal, some isolation can be achieved with the Type 874-FBL because of the 4700-pF blocking capacitor. A typical connection is shown in Figure 7. The reactance of the 4700-pF capacitor is about 3500 ohms at 10 kHz.

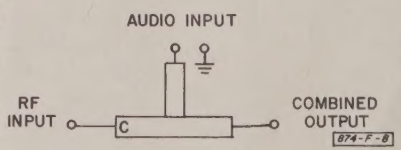


Figure 7. Connection of the Type 874-FBL to permit combination of audio and rf signals.

The complete line of GR874 coaxial air line elements and patch cords permit easy assembly of coaxial systems utilizing the Type 874-FBL.

*Gelnovatch, V. and Hambleton, G. E., "1 Gc Transistor Amplifier Stage Using Linvill Technique", *Proceedings of the IEEE*, Vol. 52, No. 10, October 1964, p. 1262.

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